Georgia's State Implementation Plan for the Atlanta Ozone Non-attainment Area

Executive Summary

July 17, 2001

Incorporates original SIP Submittal of October 28, 1999 and all Subsequent Revisions

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State Implementation Plan For The Atlanta Ozone Non-attainment Area

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A. INTRODUCTION

1. Ozone and the National Ambient Air Quality Standard

Ozone is a highly reactive pollutant formed in the air by a series of complex reactions involving precursor compounds, mainly nitrogen oxides (NO_x) and volatile organic compounds (VOC). These reactions require the presence of intense sunlight. Therefore, the hot, stagnant weather conditions of summer are when ozone is a problem. For the Atlanta area this period is usually June, July and August.

The precursor chemicals- NO_x and VOC - are both produced by human activity, but natural processes account for a large portion of the VOC. Based on the 1990 emissions inventory, vegetation (biogenic emissions) accounts for at least 60% of all VOC emissions in the 13 county non-attainment area. Human activities that contribute heavily to both VOC and NO_x emissions include many industrial and manufacturing operations, combustion processes, off-road activities including boating and lawn care, and vehicle usage.

The national ambient air quality standard (NAAQS) for ozone is based on the expected number of days per year with a one hour concentration of 0.12 ppm (parts per million) or greater. For an area to achieve attainment the average number of days above the standard within that area must be equal to or less than one (1), for three (3) consecutive years. This means that if an ozone monitoring site measures four (4) days above standard in a year, that site will be in violation even if no readings above standard are measured during the next two (2) years. The area in which that monitor is located is considered to be non-attainment. The severity or magnitude of the exceedance is determined by the amount that the measurement is above 0.12 ppm.

The area in which the measurement is made is classified by the magnitude of the ozone. Five (5) classifications of non- attainment for the one-hour ozone standard are specified in the 1990 Clean Air Act Amendments (CAAA) - Marginal, Moderate, Serious, Severe, and Extreme.

2. Atlanta Non-attainment Status

The non-attainment classification status of Atlanta and other areas of the country was based on ozone air sampling measurements made during 1987-1989. The ozone air sampling network from which these measurements were gathered consisted of five (5) sites.

From these three years of data it was determined that Atlanta should be classified as a Serious non-attainment area.

3. Non-attainment Boundaries

The Atlanta ozone non-attainment area consists of the following counties: Cherokee, Clayton, Cobb,

Coweta, DeKalb, Douglas, Fayette, Forsyth, Fulton, Gwinnett, Henry, Paulding, and Rockdale. The Atlanta metropolitan statistical area currently consists of the counties listed above, as well as the following seven counties: Barrow, Bartow, Carroll, Newton, Pickens, Spalding, and Walton.

4. Ozone Attainment State Implementation Plan

In accordance with the CAAA, serious ozone non-attainment areas like the metro-Atlanta area were required to submit a revised State Implementation Plan (SIP) for ozone by November 15, 1994 that demonstrated attainment by 1999. Georgia EPD attempted to develop such an attainment plan, but was unable to do so by that date.

At that time, the following conclusions and observations regarding this inability to show attainment were made:

a. The required use of worst-case weather conditions experienced in 1987 and 1988 to show future-year attainment probably was inappropriate using the Urban Airshed Model (UAM), the selected photochemical grid model. These weather conditions were highly unusual in degree and temporal extent and occur very infrequently (the worst ozone levels since 1974). Using such non-representative and worst-case conditions to develop control strategies could result in unnecessarily harsh regulatory requirements without the ability to evaluate other factors in the modeling analysis.

b. All modeling scenarios run to this point showed the UAM ozone concentrations were unexpectedly high even with significant emission reductions. This was noticed initially when it was shown that even reductions in all ozone precursor emissions of up to 66% beyond planned controls had little positive effect on ozone concentrations, and in some cases 33% reduction in NO_x theoretically resulted in ozone increases.

c. Ozone formation appeared to be primarily weather driven. Obviously, precursors have to be present to produce ozone, but modeled projections were relatively insensitive to reductions compared to meteorological factors, as discussed in b. above.

d. Based upon ozone measurements upwind of Atlanta during certain days of violation of the standard, and the best information available for UAM computer modeling, it appeared that ozone and reactive precursors coming into the Atlanta 13-county area were often significant - sometimes over half of the current allowable ozone standard concentration. Therefore, transport from upwind emission sources appeared to be significant under certain relatively stagnant weather conditions. These are the conditions that normally produce the highest ozone.

Other states in the eastern U.S. also failed to submit necessary attainment plans by November 1994. Georgia began work with EPA, 36 other states, and stakeholders in a consortium known as the Ozone Transport Assessment Group (OTAG) to study the issue of transported ozone and ozone precursors. For

about two years, OTAG evaluated air monitoring data, performed extensive photochemical grid modeling, and developed possible VOC and NO_x control strategies which could be recommended to EPA as ways to address the common problem of transported air pollution. OTAG completed its work in June 1997, from which the following conclusions were made:

- The southeast appears to be meteorologically decoupled from the midwest and northeast, indicating little transport either way to and from the southeast.

- There does appear to be significant interstate transport, including within the southeast.

- Reductions of VOC and NO_x in urban areas has an impact on ozone reduction within those areas.

- Reductions in NO_x emissions in rural areas can have a significant impact on urban areas longer distances away.

Given the need to allow the OTAG process to advance the quality and reliability of the science of predicting ozone, and to evaluate interstate transport of ozone and ozone precursors, EPA moved the required submittal date for revised Attainment SIPs until April 1998. The State of Georgia submitted the revised Attainment SIP at that time. EPD's analysis indicated that Atlanta would not attain the ozone standard by 1999. However, the model did predict that emission reductions due to the proposed NOx SIP call coupled with other measures would result in attainment of the ozone standard. This modeling analysis was submitted in the SIP along with the three emission reduction measures that could be implemented immediately. These new emission reduction measures were:

- New rules regulating the type of gasoline sold in 43 counties in and around metro-Atlanta during the ozone season. This measure would have reduced NO_x emissions by 16.7 tons per day. (The area was eventually reduced to 25 counties due to distribution issues).

- Modifications at Georgia Power Plants Yates and McDonough (both located within the 13-county non-attainment areas), for seasonal application of natural gas technologies, reducing NO_x emissions by an average of 25.90 tons per day; and

- A Voluntary Ozone Action Program (VOAP) to be put in place to obtain voluntary actions from local businesses, governments, schools, universities and the general public which will reduce VOC and NO_x emissions during episodes of expected high ozone concentrations.

Building on the recommendations of OTAG, EPA issued the final NO_x SIP call in September of 1998. The NO_x SIP call requires Georgia, 21 other States, and the District of Columbia to submit SIPs that reduce emissions of NOx to address the transport of ozone. The NO_x SIP call will reduce total summertime emissions of NO_x by about 28% (1.2 million tons) in the aforementioned area.

5. Metropolitan Atlanta

Atlanta is one of the fastest growing regions in the United States, if not the world, in terms of economic expansion, population increase, residential construction, and almost every other kind of growth. This expansion, which has been going on for more than a decade, shows no signs of abatement. Any plan designed to address air pollution in the Atlanta area, in order to be taken seriously, must consider Atlanta=s continued growth beyond the present 13-county 1-hour non-attainment area, and therefore, emission sources inside *and* outside the non-attainment area.

Atlanta has attracted more people since 1990 than any other metropolitan area except Los Angeles. Three of the ten fasting growing counties in the United States (Forsyth, Henry, Paulding) are found in the Atlanta metropolitan area. The Bank of America reported in 1997 that "strong in-migration has pushed population growth to about three times the national average in the 1990s."

The growth is expected to continue. In fact, "with a diverse economy, affordable housing, and above average per capita income, Atlanta is well-positioned to remain one of the nation's fastest growing metro areas well into the next century," – *Money Magazine*

With a population increase has come development, housing, and economic success, but also traffic congestion and air pollution. These problems range, however, over a very wide geographical area.

5.1 Vehicular Mileage Growth

Atlantans now travel more miles per day per capita than their counterparts in any other major metropolitan area in the U.S. - 33.96 miles per person per day (1997 data). The 13-county Atlanta area residents drive an estimated 110.4 million miles per day - a distance equal to a trip from the earth to the sun and part way back. This is an increase of 35.5% over 1990 total vehicular miles traveled. It's estimated that metro-Atlantans will be driving 171 million miles a day by 2020. The average commute time is 50.8 minutes (round-trip) , and that has grown by six minutes over the last 14 years.

The same level of mobile NO_x emission densities (tons per year per square mile) found 20 years ago in the Atlanta area and contributing to its non-attainment status are now found in the counties surrounding it as well as the metropolitan statistical areas of Athens, Augusta, Chattanooga, Columbus, and Macon. This NO_x emission density sprawl is reflective of population and vehicular mileage increases in the area and indicates that the problem is spreading outward in the shape of a giant doughnut.

It is not surprising that, compared to other non-attainment cities, Atlanta has relatively more emissions from mobile emissions and relatively less from stationary sources.

5.2 Urban Sprawl

The sheer size of the Atlanta area contributes to the amount of vehicular miles traveled, and therefore mobile NO_x emissions. Compared with other non-attainment areas of serious and above the Atlanta metropolitan area (currently 6,126 square miles) ranks 8th out of 22 in terms of square miles. Of the metropolitan areas outranking Atlanta - Dallas/Fort Worth, Phoenix, Philadelphia, Los Angeles, Chicago, Houston and New York - three of them have in-town resident percentage far higher than Atlanta, which again demonstrates that, given the land size of the Atlanta area and the great percentage of suburban dwellers, Atlantans travel tremendous distances each day to work.

5.3 Change in Population and Emission Densities

It is clear that any solution to Atlanta's smog problem must include controls within the area of this urban sprawl. A review of population growth information indicates that, just as with mobile NO_x emission densities, population and total VOC and NO_x emission densities found in the Atlanta Metropolitan Statistical Area (MSA) core are now of the same level in the counties surrounding the core and even the MSA itself. It can be concluded, therefore, that population and emission levels that previously led to violations of the ozone standard twenty years ago in the MSA core, will continue to contribute to that problem and eventually result in violations in those non-MSA counties if present development and growth patterns continue unchanged.

5.4 Area of Significant Impact

Before determining the extent of the area where reductions will be targeted, the following questions must be answered: 1) From how far away can pollutant emissions reach the Atlanta area?; 2) Of those emissions that reach the Atlanta area, which have a "significant impact" on the non-attainment area?; and 3) How is "significant impact" defined?

As previously stated, OTAG was established in early 1995 by EPA and the Environmental Council of the States (ECOS), to assess transport, the process of ozone and its precursors traveling to areas downwind of their original sources. OTAG found that transport is especially significant in certain areas, including the "Northeast Corridor" (the area stretching from Washington, D.C. to Boston) and in portions of the Midwest. Transport distance appears to be somewhat less in the Southeast, although transport does occur.

Major findings of the OTAG's Air Quality Analyses Work group include the following:

A. Spatial and temporal scales of ozone transport, derived from various air quality analyses, range up to about 2 days and 500 miles and are typically longer than those derived from OTAG model results.

B. Ozone transport occurs in the OTAG domain on local, subregional, and regional scales.Local transport in the 30-150 mile range likely contributes most to ozone non-attainment.Subregional transport occurs over the 100-300 mile range, and regional transport can occur over the 300-500

mile range

C. High ozone levels in the southern portion of the OTAG domain are typically associated with stagnant transport conditions resulting in shorter transport scales than on average.

The key findings of the OTAG's Modeling and Assessment Subgroup are as follows:

A. Ozone reductions in a given region are most influenced by emissions reductions in the same region but are also influenced by emissions reductions in upwind regions.

B. There are several different scales of transport: inter-city, inter-state, and inter-regional Spatial scales are farther in the North than in the South.

OTAG has shown that ozone does indeed drift across state lines. While the OTAG modeling does not indicate that metro Atlanta's ozone problem is influenced by faraway states such as New York, Michigan and Ohio, it does show that, under certain conditions, ozone blows to and from Alabama, Tennessee, South Carolina and North Carolina.

Ozone (and its precursors) that drifts across state lines surely drifts across county lines. Add this fact to that of urban sprawl and it is obvious that the sources of ozone pre-cursors that impact the Atlanta area are not contained solely in the thirteen county non-attainment area or even the 20-county Metropolitan Statistical Area. It is reasonable to conclude that local transport occurs on some scale, if only on the low end of the 30-150 mile range determined by the OTAG Air Quality Analyses Workgroup.

5.4.1 Definition of Significant Impact

EPA has already established some levels of significant impact for pollutants other than ozone that may serve as guideposts for our establishment of "significant impact" of ozone and ozone precursors.Under federal regulations regarding Prevention of Significant Deterioration, construction of a major source or major modification requires determination of the impact of the source's emissions on the surrounding area and whether the impact is significant. Significance levels are defined as follows:

Pollutant	Standard	Averaging Basis	Significant Level
NO_x	100 ìg/m^3	Annual	1 ìg/m^3
SO_2	80 ìg/m^3 365 ìg/m^3 1300 ìg/m^3	Annual 24-hr 3-hr	1 ìg/m^3 5 ìg/m^3 25 ìg/m^3
PM_{10}	50 ìg/m^3 150 ìg/m^3	Annual 24-hr	1 ìg/m^3 5 ìg/m^3

Therefore, a contribution of 5 ìg/m^3 or greater of either NO_x or VOC to the Atlanta non-attainment area on a 1-hr averaging basis conservatively constitutes "significant impact".

5.4.2 Determination of Significant Impact Area

EPD used dispersion modeling to determine the maximum distance at which a generic source would have a significant impact on the Atlanta non-attainment area. EPD modeled three generic cases using the U.S. EPA screening guideline model SCREEN3. Case 1 is based on a typical 75 million Btu/hour boiler with assumed NO_x emissions of 100 ton/year. Case 2 addresses the downwind impacts from a large power plant. Case 3 is an area source of 1 km by 1 km with NO_x emissions of 50 ton/year (representing, for example, vehicle emissions over a congested area). A hypothetical range of meteorological conditions was modeled to produce conservative worst-case one-hour downwind concentration from a continuous release. Release heights varied from near ground level for the area source, to 100 feet for the small boiler, and 1000 feet for the large power plant.

The modeling indicates that maximum concentrations are reached in a short distance downwind, and then the concentrations decrease -- rapidly at first, then more slowly until at a distance downwind the decrease in concentrations is very gradual as indicated by a flat curve. The distance at which concentrations fall under the significance level of 5.0 ìg/m^3 for the 100 tpy NO_x source is 20 miles. The concentrations for the power plant and the area source are determined to be 29.1 and 6.25 ìg/m^3, respectively, even at distances of 30 miles. A major source that emits NO_x or VOC within 20 miles of the non-attainment area is considered to have a significant impact in the Atlanta non-attainment area.

The counties that have at least a portion of their area within the 20-mile range of the non-attainment area are as follows:

Banks, Barrow, Bartow, Butts, Carroll, Clarke, Dawson, Floyd, Gilmer, Gordon, Hall, Haralson, Heard, Jackson, Jasper, Lamar, Lumpkin, Meriwether, Monroe, Morgan, Murray, Newton, Oconee, Pickens, Pike, Polk, Spalding, Troup, Upson, and Walton. EPD has added counties to the area of significant impact that lie in the direction of the most frequent prevailing wind directions: Chattooga, Jones, Madison, and Putnum. These counties are extremely close to the 20-mile border and are oriented in a prevailing wind corridor. Oglethorpe and Greene counties are in the same prevailing wind corridor but are farther away from the 20-mile border. Of the counties outside the 20-mile range considered for inclusion, these counties had the lowest population densities. The EPD removed Fannin, Murray, Gilmer, and White counties from the area of influence because they are not in a prevailing wind corridor and much of the county lies outside the 20-mile range.

B. ATTAINMENT DEMONSTRATION METHODS AND INPUTS

1. Analysis Method

The Urban Airshed Model (UAM) is ideally suited for the evaluation of the effects of emission control scenarios on urban air quality because the UAM accounts for spatial and temporal variations as well as differences in reactivity (speciation) of emissions. This is accomplished by first replicating a historical ozone episode to establish a base case simulation. Model inputs are prepared from observed meteorological, emission, and air quality data for a particular day or days. The model is then run with these inputs and the results are evaluated to determine its performance. Once the model results have been evaluated and determined to perform within prescribed levels, the same meteorological inputs and a projected emission inventory can be used to simulate possible future emission scenarios. Therefore the model will calculate hourly ozone patterns likely to occur under the same meteorological conditions as the base case.

Using the UAM model, possible combinations of VOC and NO_x emission control measures with corresponding emission reductions can be modeled to project the probable impact on ozone formation. Different combinations are modeled to develop the optimum set of control measures for ozone reduction.

2. Episodes Selected

The methodology specified in Appendix B of EPA's **Guideline for Regulatory Application of the Urban Airshed Model**, was used to select the episodes to be modeled using UAM. This amounted to finding meteorological regimes when, historically, most ozone violations occurred and selecting violation days during 1987 - 1991 that represent those meteorological regimes.

After gathering meteorological data from Atlanta Hartsfield International airport and the South DeKalb College ozone monitoring site for the years 1980-1992 and sorting the days of ozone violation by maximum hourly ozone concnentration and wind regime, the following dates were selected for UAM modeling: July 29, 1987 through August 1, 1987 and July 7, 1988 thorough July 8, 1988.

3. Domain Definition

The UAM-IV modeling domain is a 40 by 40 grid with each grid being 4 x 4 km. and the southwest corner of the grid starting at UTM 660 km. east and 3665 km. north in zone 16.

The UAM-V (ISO) domain is much larger and extends into Alabama, Tennessee, and North and South Carolina. It is comprised of an outer, coarse-resolution grid that extends approximately 80 km in all directions beyond the current UAM-IV domain and a nested, higher-resolution grid that is identical to the UAM-IV domain. The coarse-grid cell size is 8km by 8km. [See Figure 2-2] The overall domain size is approximately 320 x 320 km. By including these additional grid cells, boundary condition information for the nested, urban grid will be simulated in the coarse grid rather than
estimated by the user.

4. Emissions Overview

The emissions in the UAM-IV domain are based on the EPD's **1990 Base Year Ozone Emission Inventory for Atlanta, Georgia, Non-attainment Area**. This emission inventory was submitted in final form to the EPA in November 1993. EPA guidance was used to develop this inventory for the 13 counties in the Atlanta ozone non-attainment area. Emissions for the additional 30 counties in the UAM-IV domain were developed using a similar approach. Emissions for the remaining areas in the UAM-V domain are based on the **Regional Interim Emission Inventory** (EPA, 1993).

The modeling emission inventory is the sum of five emission source classes: 1) Point, 2) Area, 3) On-Road Mobile, 4) Non-Road Mobile, and 5) Biogenic. The first four source classes are anthropogenic (man-made) sources. The biogenic class consists of emissions from trees, crops, vegetation, and other natural sources. For a detailed description of each emission source class refer to the **1990 Base Year Ozone Emission Inventory for Atlanta, Georgia, Non-attainment Area** (EPD, 1993). Day specific, hourly and gridded emissions for each of the five classes were developed for the July 29 - August 1, 1987 and July 7 - 8, 1988 basecase modeling episodes. These emissions were used in validating the Atlanta UAM-V model application. Baseline emissions were also estimated for 2003 for use in the attainment modeling demonstration. All emissions were processed using the US EPA's Emissions Preprocessor System (EPS2), Version 2 (EPA, 1992).

A summary of all the emissions used in the 1987 and 1988 basecase, and 2003 baseline UAM-V modeling is shown in Tables 2-1 through 2-6.

C. ATTAINMENT DEMONSTRATION

1. Modeling Demonstration

1.1 Benchmarks for Attainment

In Guidance On Use of Modeled Results to Demonstrate Attainment of the Ozone NAAQS (EPA-454/B-95-007, June 1996), EPA describes two acceptable approaches for demonstrating attainment of the National Ambient Air Quality Standard (NAAQS) for ozone: a statistical approach and a deterministic approach. The former approach is used here.

The statistical approach consists of a set of tests (benchmarks) plus an optional "weight of evidence determination." Depending on the severity of episodes modeled, the statistical approach allows up to three exceedances per subregion with a subregion defined by the guidance as an area that approximates a 15 by 15 km region. In this case 16 of the 4 by 4 km grids in the UAM-IV domain and 4 of the 8 by 8 km grids in the UAM-V domain were combined to form 16 by 16 km subregions The total UAM-V modeling domain consisted of a 20 by 20 grid of subregions.

Although predicted exceedances of the 1-hour, 0.12 ppm ozone standard are allowed under the guidance, the statistical approach limits the magnitude of each allowed exceedance so as to be consistent with observed ozone patterns at sites currently attaining the NAAQS. Further, if the model under predicts observed ozone, the statistical approach requires at least an 80% reduction in the predicted incidence of ozone greater than 124 ppb. If the model fails the benchmarks, a supplemental weight of evidence determination may be employed to describe whether attainment is still likely despite model results that do not strictly satisfy the statistical test.

1.2 Modeled Control Packages

Various emissions control packages were simulated using the UAM-V to determine the effect of the controls on ozone air quality in Atlanta. Results of the simulations were also compared with the benchmarks described in section 3.1.1 to determine if the controls were sufficient to demonstrate attainment of the 1-hour, 0.12 ppmv ozone NAAQS. The two control packages are called 2003 Base and 2003 Attain. The 2003 Base package consists of the 2003 emissions described in section 3.3. These emissions include all growth assumptions, Georgia mandated controls in place by 1999, and Federal Clean Air Act mandated controls that will occur by 2003. The 2003 Attain package consists of the emissions from the 2003 Base package with additional Georgia mandated controls that could be in place by 2003. Figure 3-1 summarizes the differences in these emissions control packages for the UAM-IV modeling domain.

1.2.1 2003 Base

The purpose of simulating the 2003 Base package is twofold. First, it demonstrates the effectiveness of all mandated controls net of growth that have been or will be implemented by 2003. Second, it establishes a baseline by which the effectiveness of any additional controls implemented by 2003 or beyond can be measured.

1.2.1.1 Emissions

The emissions used in this simulation are the same as those 2003 emissions described in section 2.3. These emissions have been grown (projected) to 2003 and then reduced by all relevant Federal and State mandated controls. The controls that apply to the 2003 Base package are those included in the **15% Georgia State Implementation Plan** (November 15, 1993; revised September 1994, November 1994, and June 17, 1996), the **1994 State Implementation Plan for the Atlanta Ozone Non-attainment Area**, Section 3: The Post-1996 Rate-of-Progress Plan (November 15, 1994; revised June 17, 1996), Phase I gasoline, and natural gas technologies on Georgia Power Plants McDonough and Yates. Tables 2-4 through 2-6 summarize the emissions used in this emissions control package.

1.2.1.2 Boundary Conditions

As with Georgia, other States have also experienced substantial changes since 1987 and 1988 such that the quality of air exported from these areas is likely to be significantly different in 2003 than the air exported over a decade previous. It is this exported air which may be imported into Atlanta through the airshed's lateral and top boundaries. For the model validation runs of July 29 - August 1, 1987 and July 7 - 8, 1988, the boundary conditions were estimated from observations taken near the location of the UAM-V domain boundaries. Although based on the same meteorology, these boundary conditions are probably not an accurate representation of what may occur in 2003 because of changes in the emissions of ozone precursors in Georgia and throughout the Southeast. Therefore, the boundary conditions were determined through guidance provided by EPA Region IV in a letter to EPD dated December 23, 1997, in which EPA suggests that boundary conditions could be taken from round 2 modeling performed for OTAG.

1.2.2 2003 Attain

The 2003 Attain package includes all emissions controls inherent to the federally mandated controls package plus an estimate of the additional reductions that could occur by 2003 due to the aforementioned Regional NO_x control requirements. This simulation also investigates the effect of clean boundary conditions on ozone non-attainment in Atlanta.

1.2.2.1 Emissions

In addition to the controls described in the 2003 Base Case package, additional reductions are applied by

estimating the effect of the control measures EPA used to establish Georgia's 2007 Statewide NO_x budget. These include controls from electric power generating devices and non-utility point sources. In the Regional NO_x SIP Call, EPA estimates that the following reductions could be achieved by 2007 in Georgia during the ozone season:

Category	2007 CAA Base (tons)	Proposed Budget (tons)	Percent Reduction
Electric Utilities	86,455	30,402	65%
Non-utility Point	36,827	29,024	21%
Area Sources	13,212	13,212	0%
On-Road Mobile	90,499	90,499	0%
Non-Road Mobile	26,497	26,497	0%
Total	253,490	189,634	25%

The reductions stated above plus reductions described in Section 3.2 were modeled together and these reductions constitute the 2003 Attain package. The net effect of these controls is shown in the emissions summaries of Tables 3-3 through 3-5.

1.2.2.2 Boundary Conditions

As was the 2003 Base Case, the boundary conditions were determined through guidance provided by EPA Region IV in a letter to EPD dated December 23, 1997.

1.2.2.3 Results

The peak simulated concentrations for the 2003 Attain package with boundary conditions representative of OTAG Run 5 were 164 ppbv for July 31, 133 ppbv for August 1, and 154 ppbv for July 8. Again, the first benchmark requires that no more than one exceedance of 124 ppbv are allowed in any subregion in the modeling domain. Figure 3-4 shows that seven of the subregions in the Atlanta non-attainment area have at least two exceedances of 124 ppb. Thus, ***Benchmark 1 is failed.***

The second benchmark states that for episode days for which modeled exceedances are permitted, the predicted daily maxima cannot exceed the prescribed maximum ozone allowed value. Figure 3-5 shows that there are 17 subregions that exceed the maximum ozone allowed of 130 ppbv on July 31. For the next day, August 1, 1987, 6 subregions exceeded the maximum allowed of 124 ppbv. There are 4 subregions that exceed the maximum ozone allowed of 130 ppbv on July 8. Thus, ***Benchmark 2 is failed.***

Finally, Benchmark 3 requires an 80% reduction of grid-hours exceeding 124 ppb for the August 1 and July

8 primary episode days that under predict observed concentrations by more than 5%. According to the table below, we can expect 95.6%, and 75.9% reductions in exposure, respectively, for August 1 and July 8 are predicted, with a combined reduction in grid-cell hours of 88.6%. Thus, ***Benchmark 3 is passed***.

Grid-hours > 124 ppb	8/1/87	7/8/88	Combined
1987 (1988) Base	613	340	953
2003 Attain	27	82	109
Per Cent Reduction	95.6%	75.9%	88.6%

2. Control Strategies

Following a process of evaluating all possible control measures with various levels of emission reduction, and the time necessary to implement them, the elements of an overall control strategy were developed. The implementation of these control measures will enable the Atlanta area to attain the 1-hour ozone standard by 2003 and will also ensure continuing progress towards meeting the 8-hour standard.

This control strategy targets the largest contributors to the ozone problem, continues VOC controls in the urban area, and adds NO_x controls inside and outside the 13-county Atlanta non-attainment counties.

Controls that were in place by May 1, 1999:

- All elements of the 15% Rate of Progress Plan, which included 117.06 tons per day of VOC reduction from 1990 to 1996. This includes, among other things, the enhanced vehicle inspection and maintenance program, low RVP gasoline, Stage II gasoline vapor recovery, a ban on open/slash/prescribed burning, and a reliance on federal rules on architectural and industrial maintenance coatings, auto body repair shops and new vehicle emissions.

- All elements of the Post-1996 (9%) Rate of Progress Plan, which included 50.10 tons per day of NO_x reductions from 1990 to 1999. This includes, among other things, NO_x RACT on certain stationary sources, and the enhanced vehicle inspection and maintenance program.

- A rule lowering the sulfur content of gasoline sold in a 25-county area in and around metro-Atlanta during the ozone season. This will reduce NO_x and VOC emissions by 11.7 and 17.8 tons per day, respectively, in 1999.

- Modifications at Georgia Power's Plants Yates and McDonough (both located within the 13-county non-attainment area), for seasonal application of natural gas technologies, reducing NO_x emissions by an average of 25.90 tons per day in 1999.

- A Partnership For A Smog-Free Georgia (PSG) Program has been put in place to obtain voluntary actions from local businesses, governments, schools, universities and the general public which will reduce VOC and NO_x emissions by 6.51 and 4.28 tons per day, respectively, during the summer season when ozone concentrations are the highest.

Controls that are to be implemented by May 1, 2003:

- A rule further lowering the sulfur content of gasoline sold in a 45-county area in and around metro-Atlanta during the ozone season. This will reduce NO_x and VOC emissions by 23.54 and 30.50 tons per day, respectively, in 2003.

- Modifications at point sources with large electric utility steam generating units, located throughout the non-attainment area and the area of significant impact, reducing NO_x emissions by about 290 tons per episode day in 2003.

- Modifications at three point sources with large NO_x emitting units other than electric utility steam generating units, located in the 13 county area, reducing NO_x emissions by 18.83 tons per day in 2003.

- Additional enhanced I/M requirements for the 13 county non-attainment area providing NO_x and VOC emissions reductions of 11.34 and 13.17 tons per day, respectively, in 2003.

- New Source Review (NSR) requirements expanded to applicable point sources located in the area of significant impact, providing NO_x emissions reductions of 21 tons per day in 2003.

- A new rule to regulate NO_x emissions from medium-sized new boilers and other fuel-burning equipment in the area of significant impact in and around the Atlanta ozone non-attainment area, providing NO_x emissions reductions of 0.7 tons per day in 2003.

- A new rule to regulate NO_x emissions from new and existing stationary engines and new stationary gas turbines located in the area of significant impact in and around the Atlanta ozone non-attainment area and used to generate electricity (including peaking power) for a NO_x reduction of at least 30 tons per day, within the 45-county area, in 2003.

- Regional NO_x reductions, as specified by EPA on October 27, 1998, which reduce transported ozone and ozone precursors entering the metro-Atlanta area, totaling greater than 95 tons per day in 2003.

- National VOC and NO_x control measures from on-road mobile, off-road mobile, and area sources, such as the national low emission vehicle (NLEV) program, locomotive engine standards,

phase 2 requirements for VOC consumer and commercial products, marine engine standards, and phase 2 and 3 non-road diesel engine standards.

2.1 RACM Analysis

Section 172(c)(1) of the Clean Air Act requires State Implementation Plans (SIPs) to provide for the implementation of all reasonably available control measures (RACM). Georgia EPD has performed an analysis to determine if any additional RACM measures are available for the Atlanta 1-hour ozone non-attainment area.

Each control option was evaluated as to: 1) Authority to implement; 2) Amount of NOx reductions; 3) Amount of VOC reductions; 4) Whether a similar measure is already being implemented; 5) Cost effectiveness; 6) Whether SIP credit has already been taken for the measure and 7) Whether the measure can be implemented by May 1, 2003 (measures implemented after this date cannot advance the 2004 attainment date).

The following types of options were eliminated from consideration as a RACM and have been grouped accordingly within the primary control option category: 1) Options for which the State had no authority to implement; 2) Options that have been superceded by similar measures already implemented; 3) Options which have been implemented but for which no SIP credit has been taken and/or measures that have been implemented through the Transportation Improvement Plan (TIP); 4) Options with a cost effectiveness of greater than $5,000/ton; 5) Options with no SIP credit but the measure had already been implemented and 6) Options that cannot be implemented by May 1, 2003. The remaining measures were grouped, by primary category, under the heading “remaining measures.”

The State Implementation Plan for bringing the Atlanta area into compliance with the ozone standard relies upon reductions from the NOx SIP Call. In order to advance the attainment date from November 15, 2004, a control measure or set of control measures would need to provide a greater effect, by May 1, 2003, on ozone reduction than the NOx SIP Call measures.

The effect of the “remaining measures” on ozone reduction will be less than that of the NOx SIP Call measures in 2004. This analysis therefore demonstrates that no additional RACM measures are available for the Atlanta 1-hour ozone non-attainment area.

3. Conclusions

The bright line tests of the statistical determination in this Section 3 does not demonstrate attainment of the 1-hour ozone standard in the Atlanta area by 2003. In November of 1999, EPA issued the "Guidance for Improving Weight of Evidence Trough Identification of Additional Emission Reductions, Not Modeled" for situations like those described in this section where attainment is close, but additional emission reductions are needed. We have used this guidance to calculate the 'shortfall' in reductions and have listed the proposed additional emission reductions we expect to bring the Atlanta area into attainment with the ozone NAAQS.

D. ADDITIONAL WEIGHT OF EVIDENCE

1. Determination of Required Additional Reductions "Shortfall Calculations" (Utilizing corrected 2003 controls)

Method 1

1. Calculate the average (over all modeled days) predicted daily maximum 1-hour ozone concentration at the area of the highest modeled concentration first with the current emissions and then with the future emissions.

   Note: The 1996 Controls modeling was used
   The 1996 peak modeled concentrations were 183.9, 158.7, and 177.5 ppb. The 2003 peak concentrations are 164.3, 154.2, and 132.9 ppb. The average modeled concentrations (i.e., AVGP) for these years are:

   $AVGP_{2003}$ = 150.5 ppb $AVGP_{1996}$ = 173.4 ppb

2. Calculate the relative reduction factor (RRF) by taking the ratio of the average daily maximum 1-hour ozone concentration obtained with future emissions to that obtained with the current emissions.

   $(RRF) = (AVGP_{2003})/(AVGP_{1996}) = 150.5/173.4 = 0.8679$

3. Calculate the area-wide design value for 1996 (DV_{96}) using the design values that include the year of current emissions. The design value for 1996 was calculated by averaging the design values for 1994-1996, 1995-1997, and 1996-1998. (Averaging three years of design values is performed to reduce the variability in the design value due to meteorology). The respective value for each of those years was 147, 145, and 146 ppb. Thus, the average 1996 design value is:

   DV_{96} = 146 ppb at the Confederate Avenue monitor site

   Note: The Confederate Ave monitor site was used to obtain a value that was close to the peak area site.

4. Multiply the relative reduction factor by the average design value to compute the future design value (DVF).

   $(DVF) = (RRF)*(DV_{96}) = 0.8679 * 146 = 126.72$ ppb

5. Calculate the change in air quality design value (AQ) by subtracting the estimated future design value (step 4) from the base air quality design value (step 3).

$$AQ = DV_{96} - DVF = 146 - 126.72 = 19.28 \text{ ppb}$$

6. Estimate the percent reduction in NOx emissions and VOC emissions that occurred within the 13-county area before and after controls. Biogenics are NOT included in emissions.

The following emission rates are found in the UAM model:

NOx_{1996} = 563.2 tpd	NOx_{2003} = 419.1 tpd
+ 7.42 from open/slash burning	+ 7.75 from open/slash burning
+ 321.53 from electric generating units	+ 213.61 from electric generating units
+ 15.23 from 32 counties	+ 9.06 from 32 counties
+ 0.00 from combustion turbines	+ 4.55 from combustion turbines
= 907.38 tpd	= 654.07 tpd

Note: The emissions from the Georgia Power plants are based on an average of the three episode days. They include the most likely scenario for emissions from individual emission units. However, this should not be construed as individual emission limits for those units.

VOC_{1996} = 508.6 tpd	VOC_{2003} = 376.83 tpd
+ 36.2 from open/slash burning	+ 37.9 from open/slash burning
+ 3.31 from prescribed burning	+3.50 from prescribed burning
+ 31.50 from 32 counties	+ 13.99 from 32 counties
= 579.61 tpd	= 432.22 tpd

$$\%NOx_{Rd} = [(907.38 - 654.07)/907.38]*100 = 27.92\%$$

$$\%VOC_{Rd} = [(579.61 - 432.22)/579.61]*100 = 25.43\%$$

7. Divide the percent reduction in NOx emissions by the change in the air quality design value and divide the percent reduction in VOC emissions by the change in air quality design value.

$$NOx_{norm} = \%NOx_{Rd} / AQ = 27.92\% / 19.28 \text{ ppb} = 1.45 \text{ \%/ppb}$$

$$VOC_{norm} = \%VOC_{Rd} / AQ = 25.43\% / 19.28 \text{ ppb} = 1.32 \text{ \%/ppb}$$

8. Estimate the amount of additional ozone reduction needed by taking the difference between the future design value and 124 ppb, the maximum ozone design value consistent with meeting the NAAQS.

$$RN = 126.72 - 124 = 2.72 \text{ ppb}$$

9. Calculate additional necessary emission reductions by taking the product of each of the normalized emissions reduction factors and the amount of ozone reduction needed.

$$NOx_{needed} = RN * NOx_{norm} = 2.72 \text{ ppb} * 1.45 \text{ \%/ppb} = 3.94 \text{ \%}$$

$$VOC_{needed} = RN * VOC_{norm} = 2.72 \text{ ppb} * 1.32 \text{ \%/ppb} = 3.59\%$$

Percent amount of reductions needed from 1996 base: **NOx = 3.94%**
VOC = 3.59%

Amount of reductions needed in tons per day:

NOx = 907.38 tpd * 3.94% = 35.75 tpd
VOC = 579.61 tpd * 3.59% = 20.81 tpd

Required NOx Reductions	**35.75**

Industrial Open Burning Ban	-0.24
Commercial Open Burning Ban	-0.19
Residential Open Burning Ban	-3.66
Slash Burning Ban	-3.66
Additional EGU Controls	-44.06
Relieve NSR in 26 Counties	+1.73
Relieve RACT in 26 Counties	+10.98
Delay RACT in 6 Counties	+0.81
New Combustion Turbine Rule	-3.1

Extra NOx Reductions Beyond Those Required	**5.64**

Required VOC Reductions	**20.81**

Industrial Open Burning Ban	-0.91
Commercial Open Burning Ban	-0.96
Residential Open Burning Ban	-18.48
Slash Burning Ban	-17.55
Prescribed Burning Ban	-3.5
Relieve NSR in 26 Counties	+0.2
Delay RACT in 6 Counties	+3.69
Relieve RACT in 26 Counties	+10.66

Extra VOC Reductions Beyond Those Required	**6.04**

E. 2004 ATTAINMENT DEMONSTRATION

1. Summary of Demonstration

The analysis presented in Sections 1 through 4 follows 1999 EPA guidance and demonstrates that the 2003 modeling inventory plus additional reductions will provide the Atlanta area with attainment of the 1-hr ozone NAAQS in the year 2003. An underlying assumption of this analysis is that national NOx measures would be in place by that year.

However, on August 30, 2000, the United States Court of Appeals for the D.C. Circuit issued an order extending the compliance date for the NOx SIP Call from May 1, 2003 to May 31, 2004. Regional NOx emission reductions relied upon for the attainment demonstration cannot be assumed to occur before the Court ordered compliance date. This delay will adversely impact Atlanta's attainment of the 1-hour ozone. For these reasons, we request in a letter found in Appendix I that Atlanta's attainment deadline be extended until November 15, 2004. We therefore proceeded with the development of the 2004 emission inventory with additional reductions, also projected to 2004.

Comparison of the 2003 and 2004 inventories indicate that NOx emissions increase somewhat over the UAM-IV domain, while VOC emissions decrease significantly. Sensitivity analyses indicate that any incremental ozone increase due to this area-wide increase in NOx emissions is offset by the decrease in ozone due to the VOC emission reductions. Predicted ozone concentrations for 2004 do not exceed the predicted ozone concentrations for 2003.

Therefore, attainment is indicated for 2004.

2. 2004 Ozone Attainment Demonstration SIP Reductions

Control Measure	2004 NOx Reduction (TPD)	2004 VOC Reduction (TPD)
GA gasoline	23.74	24.56
Large electric utility steam generators[1]	289.83	0
Partnership for a Smog Free GA	4.28	6.51
Large NOx units in 13 Co. NAA	18.83	0
Changes in Enhanced I&M in 13 Co. NAA	12.25	11.33
Expanded new source review rule	20.94	0
Expanded RACT rules	0	0
New boilers & fuel burning equip.	0.67	0
Stationary engines & gas turbines	30.00	0
National LEV program	18.19	9.07
Locomotive engine standards	4.88	0.03
Consumer/commercial products II	0	13.82
Marine engine standards	0	1.25
Non-road diesel eng. stand. II & III	7.13	12.97
Total	430.74	79.54

[1]Reduction estimates are in terms of episode day instead of typical ozone season day emissions
[2]An additional 44 tons per day of NOx reductions may result from large electric utility steam generation units located in Georgia due to the EPA NOx SIP Call rule.

Note: Our attainment demonstration modeling relied on the implementation of NOx SIP Call measures on out-of-state sources. However, the effect of these measures is difficult to quantify. It is expected that we would have an ozone reduction of 4-15 ppb in 2004 as an air quality benefit. Although we have relied on these measures, no SIP credit has been taken as we have no control over out-of-state sources.

3. 2004 Air Quality Assessment

As shown in Table 5-7, the UAM-IV domain will experience an increase in NOx emissions from 2003 to 2004 while the VOC emissions will decrease significantly during that same period. With one precursor increasing while the other decreases, it is necessary to determine the overall impact of those emission changes on the peak ozone concentration. Effects vary depending on the type of pollutant and episode day.

To ascertain the affect on ozone concentrations, and, specifically, to determine whether decreased VOC emissions coupled with slightly-increased NOx emissions will result in increased ozone concentrations, a sensitivity evaluation was conducted using UAM runs for episode days July 31, 1987; August 1, 1987; and July 8, 1988.

4. Conclusions

The UAM-IV domain will experience increased NOx emissions while the VOC emissions decrease during the same period. However, the large decrease in VOC will offset the increase of NOx within the area resulting in a no change in ozone. Therefore, we expect Atlanta to have the same attainment levels of air quality in 2004 as demonstrated for 2003. The only delay is due to the delay of the implementation of the NOx SIP Call measures.

F. ESTABLISHMENT OF 2004 MOTOR VEHICLE EMISSIONS BUDGETS FOR TRANSPORTATION CONFORMITY PURPOSES IN THE 13-COUNTY ATLANTA NON-ATTAINMENT AREA

Based on the revised link-by-link calculation methodology, on the revised speeds, registration data, VMT mix, and projected 2004 VMT, and on the control measures identified for this attainment demonstration for the 13-county Atlanta nonattainment area, the motor vehicle emissions budgets for 2004 are 106.25 and 225.12 tons per typical summer day, VOC and NO_x, respectively.

These mobile budgets of 106.25 tons per day VOC and 225.12 tons per day NO_x reflect the most up-to-date mobile modeling assumptions, including 2004 VMT projected from a state-of-the-art travel demand model for the 13 counties and July 2004 emission factors from EPA's MOBILE5b emission factor model. The control measures identified and modeled for mobile emissions used to establish these budgets, along with all other control measures in this plan, will result in attainment of the 1-hour ozone air quality standard by 2004.